



CONTRIBUTIONS IN PHYSIOLOGY BY DR. PAINE.

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NOTE to the "*Institutes of Medicine*," §350.—PROFESSOR LIEBIG'S PHYSIOLOGY.—In my communication of Sept. 25 (vol. 39, p. 209), I stated Professor Liebig's summary doctrine relative to all organic and animal motions; namely, that—

"The CAUSE of the state of MOTION is to be found in a series of changes which the food undergoes in the organism, and these are the results of processes of decomposition, to which either the food itself, or the structures produced from it, or parts of organs, are subjected."

That, I remarked, is his combustive doctrine of life; and, with the exception of its palpable contradictions by other doctrines, it is carried out in all parts of his celebrated work on "*Animal Chemistry*." Indeed, the hypothesis is often repeated; thus—

"In the animal body, we recognize as the *ultimate cause of all force only one cause*, the *chemical action* which the *elements* of the food and the *oxygen* of the air mutually exercise on each other. The only known ultimate cause of *vital force*, either in animals or plants, is a *chemical process*." And again—"All *vital activity* arises from the mutual action of the *oxygen* of the atmosphere and the *elements* of the food."

I see, now, that we are presented in a work just published by the author of the foregoing doctrine ("*Researches on the Chemistry of Food, and the Motion of the Juices in the Animal Body*," and re-published under the patronage of English and American Professors), with the following interpretation of the same phenomena. It will be seen that it is nearly the common doctrine relative to the evaporation by leaves in explaining the circulation of sap, as propounded by Dr. Hales, and as set forth in my article referred to above. The Professor infers the principle from experiments made upon *dried* membranes! Having found the membranes pervious to water, oil, &c., he proceeds to say, in a letter to Professor Horsford, re-published in the *American Journal of Science and Arts* (May, 1848, p. 415), and which I quote for the brevity of the conclusion, that—

"The employment of these results upon the processes in the animal body, scarcely requires a more detailed explanation.

"The surface of the body is the membrane from which evaporation goes constantly forward. In consequence of this evaporation, all the fluids of the body, in obedience to atmospheric pressure, experience motion in the direction towards the evaporating surface. This is obviously the *chief cause* of the passage of the nutritious fluids through the walls of the bloodvessels, and the *cause of their distribution through the body*. We know now what important function the skin fulfils through evaporation"!

Now, it is hardly necessary to say, in refutation of the foregoing hypothesis, that it is not only founded upon experiments upon dead matter, and ascribes all the processes of life to the merest physics, but it isolates the functions of the skin from all the other secretory processes, whose effect would be the same as imputed to the skin, if evaporation and atmospheric pressure were "the chief cause of the passage of the nutritious fluids through the walls of the bloodvessels, and the cause of their distribution through the body." The straining off of bile, urine, saliva, &c., and even of the "nutritious fluids," would be exactly the same in effect as perspiration; for it is unimportant whether the products escape into the air or go into the bladder, &c. The pressure of the atmosphere, therefore, would be equally balanced throughout, and amount to nothing.

That the reader may see, at a glance, how far the distinguished chemist is also a physiologist, and for the benefit of his numerous admirers, I will close this notice with an extract from the author's work on *Animal Chemistry*, which, it will be seen, is near a-kin to the foregoing. Thus—

"If we consider the fatal accidents which so frequently occur in wine countries from the drinking of what is called feather-white wine, we can no longer doubt that GASES OF EVERY KIND, whether soluble or insoluble in water, *possess the property of permeating animal tissues, as water permeates unsized paper.* This poisonous wine is wine still in a state of fermentation, which is increased by the heat of the stomach. The carbonic acid gas which is disengaged permeates through the parietes of the stomach [!], through the diaphragm [!], and through all the intervening membranes [!] into the air-cells of the lungs [!], out of which it displaces the atmospherical air" !!!

Such is only a common example of the physiology of a most able chemist, and it derives its importance alone from the eclat with which his physiological writings have been received wherever science has been cultivated, and, I may say, wherever it has not been. The consequences, therefore, are not merely such as arise from idle words, but they seriously vitiate the whole fabric of theoretical and practical medicine.

*Note to §18; 42; 409; 419.*—SECRETION.—As a consequence of the doctrine that the secreted fluids exist in the blood, as "constituent parts," it is assumed that they are habitually strained off (as we have seen in the foregoing extracts from Prof. Liebig), and that when an organ fails of its appropriate office, its secreted product may escape from the blood by way of another organ. "Sometimes," says Muller, "the suppression of a secretion in one part of the body gives rise to the appearance of the same fluid in another part." And again, "The sole secretion, of which the *constituents* do not exist *as such* in the blood, but which can, nevertheless, be formed at all times and in all parts of the body, is *pus*; the organ for its production being generated anew in the process of inflammation." (Muller's Physiology, vol. 1, pp. 474, 475, *First Edition*.)

The latter quotation is omitted in the *second edition* (p. 520), perhaps from the late reputed discovery of pus-globules in the natural blood;

and this eminent physiologist supposes that *perfect* milk cannot be eliminated by any other organ than its appropriate gland. There occurs, also, the following general qualification—"If, however, the essential ingredient of the secretion does not exist in the blood itself, the suppression of this secretion in the organ destined to form it cannot cause its metastatic appearance in other parts. The instances which have been adduced of such an occurrence are ill supported by proofs." And, again, he says,—“The formation of any one of the peculiar secretions, the essential proximate constituents of which do not exist in the blood itself, pre-supposes the operation of a *special chemical apparatus*, whether this be a membrane or a gland.” “A part of the *liquor sanguinis*, with the matters dissolved in it, is imbibed by the tissues (*by endosmosis*), by the agency of which it undergoes a chemical change.” And yet he says—"The chemical process of secretion is not at all understood." Muller finally yields to the philosophy which about balances the chemical, in his great work on Physiology, and argues that—"The nature of the secretion depends, therefore, *SOLELY on the peculiar vital properties* of the organic substance which forms the secreting canals, and which may remain the same, however different the conformation of the secreting cavities may be; while it may vary extremely, although the form of the canals or ducts remains unchanged."—(*Ibid.*, *Second Edition*, pp. 429, 474, 510, 511.)

Now the question arises, whether all these conflicting doctrines upon one and the greatest topic in organic life, put forth by the ablest physiologist of our time, can possibly be true; and if not, which are we to elect, the *mechanical*, the *chemical*, or the *vital*? Each one stands forth conspicuously in the work from which I have quoted. The mechanical and chemical are surrounded by conjectures, contradictions, and admissions of absolute ignorance of their nature and philosophy, while the vital is alone consistent, is isolated from the others, is extensively concerned with the nervous power in animals but excludes it from plants, is expounded with admirable ability and in total opposition to the others. Whence comes this confusion in fundamental principles and laws? Organic Chemistry will supply an answer.

I began this article with a view of offering a single consideration against the mechanical hypothesis of secretion, which has now become so incorporated with the chemical, that the distinction is not readily appreciable but in instances like the present, where it is assumed that the "proximates" are about as numerous in the blood as the secreted products, and generally the same. Owing to the prevalence of this doctrine we have come to be quite familiar with the term *vicarious*, as "effusions of urine from the mammary gland *vicarious* of milk," &c.

Having examined extensively the whole of this subject at former times, it is my object now only to add some conclusions from a fact which appears to me sufficiently corroborative of the doctrines of life, and opposed to all others.

Chemical analyses of the blood inform us that its composition in males and females is the same, and there appears to be no reason to

question the accuracy of a statement which is inferable from the identity of the chylopoietic and sanguiferous organs in both sexes. Upon this undoubted truth, therefore, if the "proximates" of milk, as affirmed, exist in the blood of females, they should be equally found in that of males, and the seminal fluid of the latter, or its "proximates," at least, should be present in the former. This will scarcely be maintained; nor can the period of gestation be set up in behalf of one, nor the difference of sex to expound the other, since this would be conceding the whole physiological doctrine, and therefore the fallacy of the mechanical hypothesis of secretion. If, also, there be nothing like the seminal fluid in the blood of females, and it requires a testis to generate that substance, by parity of reason, the gland which is peculiar to the female has been ordained for an equally absolute formation of milk, and for nothing else. We have, therefore, besides the simplicity and designs of Nature in any great organic plan, a special demonstration of the equal dependence of semen and milk upon common physiological laws, both in the nature and final causes of the products, and in the analogy which subsists between the organization of the two glandular organs, while each, respectively, is peculiar to the different sexes.

It must be readily seen, that this reasoning, with its analogy, is of universal application to all the organs and products of the body, and that if nothing like semen or milk exist in the blood, and it require a testis and a mammary gland to generate those products, it is equally true that there is nothing like urea, bile, gastric juice, or millions of other unique formations which go to the uses of the various parts of different species of animals, in the blood, and that a kidney, a stomach, a special organization for every special product, is as indispensable for the formation of each of the products as is the testis for the seminal fluid, or the ovarium for the germ; and the proof is as good against the imputed "vicarious" discharges of urine from the mammæ or from other parts, bile from the skin, &c., as the failure of these discharges from the testis is a proof that this organ is so constituted that it shall elaborate nothing but semen. Indeed, abstractedly from all the vast amount of proof which may be brought to the same conclusion, we might rest in the consistency of nature upon the simple analogy supplied by Muller, that pus has no existence in the blood, "*the organ for its production being generated anew in the process of inflammation.*" What, therefore, shall be said of the manufacture of gastric juice?

It is unnecessary to say that some distinguished chemists deny the existence of any of the "proximates" of urine, bile, or milk, in the blood; nor need it be added that if the product of an organ be absorbed into the circulation, and afterward excreted by the skin or kidneys, it is totally different from what is meant by a "vicarious effusion," and is on common ground with the habitual excretion of other redundancies of the blood. But we have no proof, as I have endeavored to show, that either the bile (except the coloring matter), or more than the watery parts of the urine, are ever absorbed into the circulation.

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